STATE OF CALIFORNIA
DEPARTMENT OF FISH AND GAME

AQUATIC TOXICOLOGY LABORATORY REPORT

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Lab No: P2161-2
E.P. No:
Index: K112 PCA: E2770

Date Received: 03/15/99
ATL: S102400-1

To: Kean Goh

Address: Department of Pesticide Regulation
Environmental Monitoring Branch
830 K Street
Sacramento, CA. 95814-3510

Report Date: 11/7/00

Remarks
The Department of Fish and Game's Aquatic Toxicology Laboratory staff tested Bifenthrin with cladoceran *Ceriodaphnia dubia* in an acute definitive test. The purpose of the test was to find the LC50 value for Bifenthrin to cladoceran *Ceriodaphnia dubia.* The toxicity test was conducted following ASTM and on the general guidelines of EPA/600/4-90/027F.

RESULTS OF EXAMINATION

Water Quality Parameters
Water samples were analyzed for conductivity, temperature, pH, dissolved oxygen, total alkalinity, and total hardness (Table 1).

Conclusion
The control and solvent control both had 100% survival. Survival in concentration 0.091 ppb was 35 %. Survival in concentrations 0.153 ppb, 0.392 ppb and 0.861 ppb were 0%. There was a statistically significant difference between the survival in the control and in concentrations 0.091 ppb, 0.153 ppb, 0.392 ppb and 0.861 ppb. The LC50 (95% CL): 0.078 (0.056-0.13) ppb based on linear interpolation method.

Toxicity Test

I. Test Number 110-00

II. Investigator: Donald Guy Title: Fish and Wildlife Technician

III. Test Dates 10/3/00-10/7/00

Duration 96 hours

A. Load Organisms 10/3/00

B. Began Test 10/3/00

C. Ended Test 10/7/00

IV. Toxicants: Bifenthrin

Description: Pyrethroid Pesticide $C_{23}H_{22}ClF_3O_2$

Source: FMC 97.8% active ingredient

Lot Number: E6788:143

V. Solvents: Acetone

A. Concentration in stock solution (%): 99.8

B. Maximum exposure concentration (ml/L): 1.6E10-6ml/ml acetone

C. Description: Acetone

D. Source: Baxter

E. Lot number: B1511

VI. Table 1. Water Quality Characteristics

		Auxiliary Data Summary					
Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
D-Control	Cond us/cm	407.27	378.00	438.00	17.81	1.04	11
0.036		412.83	385.00	442.00	18.53	1.04	12
0.09		414.33	393.00	447.00	19.90	1.08	6
0.153		400.80	377.00	426.00	20.07	1.12	5
0.392		398.25	373.00	422.00	20.82	1.15	4
0.86		350.50	331.00	370.00	27.58	1.50	2
acetone CT		344.83	328.00	360.00	11.96	1.00	6
D-Control	Temp	24.20	24.00	24.50	0.19	1.82	11
0.036		24.21	24.00	24.70	0.22	1.95	12
0.09		24.22	24.00	24.60	0.20	1.87	6
0.153		24.26	24.00	24.60	0.22	1.93	5
0.392		24.33	24.10	24.70	0.26	2.11	4
0.86		24.30	24.20	24.40	0.14	1.55	2
acetone CT		24.22	24.00	24.60	0.21	1.91	6
D-Control	pH	8.14	8.04	8.22	0.05	2.73	11
0.036		8.25	8.18	8.33	0.04	2.53	12
0.09		8.31	8.25	8.37	0.04	2.49	6
0.153		8.30	8.23	8.37	0.05	2.75	5
0.392		8.31	8.26	8.38	0.05	2.76	4
0.86		8.35	8.33	8.37	0.03	2.01	2
acetone CT		8.26	8.14	8.35	0.08	3.53	6
D-Control	DO mg/l	7.98	7.74	8.20	0.11	4.23	11
0.036		8.04	7.77	8.33	0.19	5.40	12
0.09		8.09	7.84	8.29	0.20	5.50	6
0.153		8.10	7.82	8.36	0.24	6.08	5
0.392		8.04	7.80	8.27	0.22	5.77	4
0.86		8.28	8.22	8.34	0.08	3.52	2
acetone CT		8.07	7.76	8.28	0.23	5.89	6
D-Control	Alkalinity mg/L	181.00	180.00	182.00	1.41	0.66	2
0.036		184.00	184.00	184.00	0.00	0.00	2
0.09		0.00	0.00	0.00	0.00		0
0.153		181.00	180.00	182.00	1.41	0.66	2
0.392		0.00	0.00	0.00	0.00		0
0.86		180.00	180.00	180.00	0.00	0.00	1
acetone CT		153.00	152.00	154.00	1.41	0.78	2
D-Control	Hardness mg/L	167.00	166.00	168.00	1.41	0.71	2
0.036		167.00	166.00	168.00	1.41	0.71	2
0.09		0.00	0.00	0.00	0.00		0
0.153		162.00	162.00	162.00	0.00	0.00	2
0.392		0.00	0.00	0.00	0.00		0
0.86		158.00	158.00	158.00	0.00	0.00	1
acetone CT		139.00	138.00	140.00	1.41	0.86	2
D-Control	Ammonia mg/L	0.00	0.00	0.00	0.00		0
0.036		0.00	0.00	0.00	0.00		0
0.09		0.00	0.00	0.00	0.00		0
0.153		0.00	0.00	0.00	0.00		0
0.392		0.00	0.00	0.00	0.00		0
0.86		0.00	0.00	0.00	0.00		0
acetone CT		0.00	0.00	0.00	0.00		0

VII. Stock Solution Confirmation

Toxicant

Nominal ppb	Actual ppb	Recovery (%)
1.6	0.861	53.7

The primary stock solution of 250 mg Bifenthrin was dissolved in 250 ml acetone to get a nominal concentration of 1,000 ppm. 1 ml of the primary stock solution, collected using a volumetric 1 ml pipette, was diluted with nano-pure water in a 100 ml volumetric flask to attain a nominal concentration of 10,000 ppb. On day O and day 2 the nominal concentration of 10,000 ppb Bifenthrin had an actual mean concentration about 50% less then expected. All dilutions below the 10,000 ppb concentration were consistent but were around 50% of the expected nominal concentrations. Recovery of spike in analysis varied from 82 to 88% with a mean of 85%.

VIII. Test Organism

A. Scientific name: *Ceriodaphnia dubia*

B. Common name: Water Fleas

C. Wet Weight (g): N/A Dry weight(mg): N/A

D. Standard Length (mm): N/A
Cepholothorax length (mm): N/A

E. Age (days/hours): <24-hours

F. Life stage: neonates

G. Source: Department of Fish and Game's Aquatic Toxicology Laboratory

H. History: Cultured in house

I. Disease treatment: N/A

J. Food: 1:1 mixture of YCT+ Selenastrum capricornutum

IX. Experimental Design

A. Toxicant delivery (static or metering system and flow rate): Static test with 48 hour renewal

Toxflow (ml/min): N/A
Dilflow (L/min): N/A

B. Loading (g/l) or (g/l/d): 15 ml of toxicant was poured into each of the four replicates per concentration. One neonate was loaded at a time until each replicate had a total of five neonates per replicate per concentration.

C. Test vessel description (volume and size): 20 ml scintillation vials.

D. Test organisms per vessel: 5

E. Vessels per concentration: 4

F. Test organisms per concentration: 20

G. Photo period: 16 hours light, 8 hours dark

H. Description of monitoring (biological and chemical): Water quality was checked daily for: conductivity, temperature, pH and dissolved oxygen. Alkalinity, total hardness and toxicant concentrations were checked on day 0 and day 2.

I. Description of loading procedures (stratified random design): The neonates were collected from mother boards and placed into a holding scintillation vial. The neonates were fed two hours before loading into the test vials. One neonate was loaded at a time until each replicate had a total of five neonates per replicate per concentration. Computerized random numbers were used to decide the test vials location on the test board. The Boards were covered with a plastic wrap and placed into an environmental chamber.

J. Description of biological measurements: Test chambers were checked daily for mortality. Dead organisms were removed.

K. Aeration: None

X. Results

Table 2 Adjusted Concentrations from Nominal to Actual (ppb).

Nominal Concentration	Day 0	Actual Concentrations Divided by .88	Day 2	Actual Concentrations Divided by .82	Mean Concentration
Control D	<RL	-	<RL	<RL	<RL
0.05	0.030	0.034	0.032	0.038	0.036
0.1	0.031	0.035	0.032	0.038	0.036
0.2	0.073	0.082	0.084	0.099	0.091
0.4	0.135	0.151	0.130	0.155	0.153
0.8	0.369	0.413	0.314	0.370	0.392
1.6	0.748	0.838	0.748	0.883	0.861
Acetone CT	<RL	-	<RL	<RL	<RL
Working Stock Solution					
10,000	5000	5,681	4,300	5,244	5,463

Reporting limit 0.010 ppb

A. Exposure variability: CV ranged from 1.6-13.6%.
Spike recovery: Day 0- 88%, Day 2- 82 % with a mean of 85%.

C. Biological measurements

Table 3 Survival Data

Concentration		Exposed	Responded	Survived
Nominal (ppb)	Actual (ppb)	No.	No.	%
0.05	0.036	20	0	100
0.1	0.036	20	0	100
0.2	0.091	20	20	35*
0.4	0.153	20	20	0*
0.8	0.392	20	20	0*
1.6	0.861	20	20	0*
Solvent Control	0	20	0	100
Control	0	20	0	100

* Indicate X2 significance (p>0.05) from control

D. Biological effect levels (ppb)

A. LC50 (95% CI): 0.078 (0.056-0.128) ppb based on survival parameters using linear interpolation method.

B. NOEC 0.036 ppb based on survival parameters.

C. LOEC 0.090 ppb based on survival parameters.

XI. Discussion

A. Unusual about test: None

B. Deviations from procedures: None

C. Other relevant information: Dissipation rate of Bifenthrin

Ratio of Dissipation (0.153-0.136)/0.153 = 0.11
Water Quality: Fell within normal parameters.
SOL v.s. DW controls no statistically significant difference was seen.
Exposure Levels: Nominal: 0.05 ppb-1.6 ppb of Bifenthrin
Actual: 0.036 ppb-0.861 ppb of Bifenthrin
Reloading: N/A

PESTICIDE INVESTIGATIONS UNIT
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